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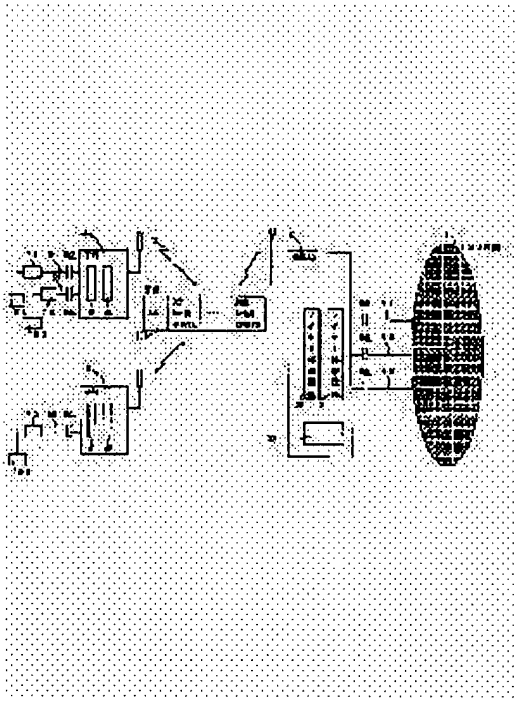
(54) ISDN SERVICE METHOD IN MULTIDIRECTIONAL MULTIPLEX COMMUNICATION SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To effectively use a communication line and to improve transmission efficiency.

SOLUTION: Layers to layers 2 are terminated between an ISDN network 1 and a base station 2 and between a terminal 61 and a slave station 3. A former protocol is used as it is between the base station 2 and the slave station 3. The frame relay of the layer 3 message of the ISDN is executed. The slave station 3 monitors the layer 3 message from the base station 2 and the terminal 61, and detects the generation and the termination of an ISDN call. Thus, line use efficiency is improved and the number of subscribers to be accommodated is increased by demand assignment line control having a function for giving the allocation/release request of a time slot for a B channel.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] It is constituted by a base station and two or more child offices, and assignment/release of the channel for transmission between a base station and the terminal office are performed according to generating/termination of a call. In the ISDN service approach in the multi-direction multiplex communication system which holds an ISDN Basic Rate Interface By, as for a base station, a child office's carrying out termination even of the layer 2 to an ISDN terminal, respectively, and supervising layer 3 message to an ISDN network The ISDN service approach in the multi-direction multiplex communication system characterized by recognizing generating/termination of a call and performing assignment/release of the channel for transmission between a base station and the terminal office.
[Claim 2] The ISDN service approach in the multi-direction multiplex communication system according to claim 1 characterized by said child office supervising said layer 3 message.
[Claim 3] The ISDN service approach in the multi-direction multiplex communication system according to claim 1 characterized by said base station and a child office supervising said layer 3 message.
[Claim 4] The ISDN service approach in the multi-direction multiplex communication system according to claim 1 characterized by for said base station supervising layer 3 message from said ISDN network side, and said child office supervising layer 3 message from said ISDN terminal side.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the ISDN service approach which the base station which has a layer 2 termination function especially, and a child office apply to the demand assignment mold cross connection method which offers the communication line of an ISDN Basic Rate Interface (2B+D) using the transmission channel assigned for every subscriber according to generating/termination of a call about the ISDN service approach in the multi-direction multiplex communication system.
[0002]
[Description of the Prior Art] The conventional multi-direction multiplex communication system is explained using drawing 9 . Drawing 9 shows the multi-direction multiplex communication structure of a system which offers the conventional ISDN Basic Rate Interface. In drawing 9 , the communication line between the child offices 3, 4, and 5 and a base station 2 is the so-called Puri Asa Inn mold cross connection method always assigned irrespective of communicative existence. An ISDN Basic Rate Interface has two Bch(es) (64kbps) and one Dch (16kpbs) on one a user and a network interface, and is an interface usable in common in various services of a telephone / not telephoning. Therefore, in the conventional example, as shown in drawing 9 , only the number of the ISDN Basic Rate Interfaces held (N individual) is required for the communication line between a base station and a child office.
[0003]
[Problem(s) to be Solved by the Invention] In the Prior art, only the number of ISDN interfaces held is required for the communication line between a base station and a child office, and also when not communicating, the communication line is always assigned. Moreover, although the user is available in the terminal of a telephone, FAX, a data terminal, etc., such traffic density is considered to be few compared with the case where the dedicated line is used. Therefore, irrespective of communicative existence, by the conventional method which always assigns the communication line, the subscriber held is restricted and there is a problem that the prompt action to the increment in a subscriber is difficult, and the utilization effectiveness of a communication line falls dramatically.
[0004] By making it the demand assignment method assigned according to generating of a call instead of the Puri Asa Inn method which always assigns the communication line, the object of this invention aims at a deployment of a communication line, and is to offer the ISDN service approach which raises transmission efficiency.
[0005]
[Means for Solving the Problem] In the multi-direction multiplex communication system which this invention is constituted by a base station and two or more child offices, performs assignment/release of the channel for transmission between a base station and the terminal office according to generating/termination of a call, and holds an ISDN Basic Rate Interface By, as for a base station, a child office's carrying out termination even of the layer 2 to an ISDN terminal, respectively, and supervising layer 3 message to an ISDN network, generating/termination of a call are recognized and it

is characterized by performing assignment/release of the channel for transmission between a base station and the terminal office.
[0006] By responding to generating/termination of a call, and assigning / releasing a communication line, this invention is an ISDN service method which offers the communication line of an ISDN Basic Rate Interface, acts even a layer 2 as the monitor of termination and the layer 3 message in a base station and a child office, respectively, and has the means which assigns the communication line between a base station and a child office by detection of the start up message of a call out of said signal, and a means to release said communication line by detection of the end message of a call.
[0007] Generating/termination of an ISDN subscriber's call are detected by carrying out the monitor of the layer 3 message in a base station or a child office, and assignment/release of the communication line between a base station and a child office are performed. It becomes unnecessary for this reason, to always assign a communication line.
[0008]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
[0009] Drawing 1 is system configuration drawing of the multi-direction multiplex communication system of the demand assignment mold which applies this invention. The circuits 51, 52, and 53 of the ISDN network 1 are connected to a base station 2, and the circuits 54, 55, and 56 which have held the child offices 3 and 4 support circuits 51, 52, and 53, and set up the communication line between the child offices 3 and 4 and a base station 2 by assignment / demand assignment line control to release according to generating/termination of a call. Therefore, there may be few communication lines between a base station and a child office than the number of subscribers which this system has held. The child offices 3 and 4 offer U points of an ISDN Basic Rate Interface to the network termination 171, 72, and NT 73 which has held terminals 61, 62, and 63.
[0010] The system configuration of the 1st example of this invention is shown in drawing 2 . In drawing 2 , the Basic Rate Interface circuits 51, 52, and 53 from the ISDN network 1 are held in the base station 2. A base station 2 and the child offices 3 and 4 are performing the Time-Division-Multiplexing (TDMA) communication link. In drawing 2 , between a base station 2 and the child offices 3 and 4, it responds to generating/termination of a call, and provides by the demand assignment line control which assigns / releases a TDMA time slot (TS) as a communication line to Dch and Bch. The frame structure of the signal transmitted and received between a base station 2, the child office 3, and 4 all over drawing is shown. Cch100 is a common control channel and is used for transfer of the control information of TS assignment between a base station 2, the child office 3, and 4, and the Dch information on a Basic Rate Interface.
[0011] While a base station 2 and the child offices 3 and 4 have layer 1 termination circuits 21, 31, and 41 and layer 2 termination circuits 22, 32, and 42 which carry out termination of its layer 1 of its and the layer 2 and can perform establishment synchronous [between a base station and an ISDN network and between a child office and an ISDN terminal / layer 1], and establishment of layer 2 link according to its individual of its, they can carry out the monitor of the two or more-layer message.
[0012] Layer 1 and layer 2 termination circuit is the same as that of a well-known thing at an ISDN communication mode, and these are easily realizable if LSI based on a CCITT criterion is used. Moreover, each child office can transmit and receive voice and data in TS specified from the transceiver function and base station of Cch. The interface between a child office and a terminal and between a base station and an ISDN network is U points of an ISDN Basic Rate Interface.
[0013] In the base station 2, it has the function to manage TS other than the transceiver function of Cch, and required TS is assigned with reference to the TS managed table 23 to Dch and Bch according to generating of a call. The circuits 51, 52, and 53 corresponding to the ISDN terminals 61, 62, and 63 are held in the base station.
[0014] Next, actuation of this example is explained to a detail with reference to the sequence diagram of drawing 7 from drawing 3 . When a call in occurs to the terminal held in the child office when call origination occurs from the terminal held in the child office, the layer 2 linkup procedure between the

ISDN networks which have held the base station, and the terminal held in the child office after the layer 2 linkup, and it is clear back, sequence actuation of an about is explained.
(1) As an example of a layer 2 linkup procedure, electric power is supplied to the terminal 61 held in the child office 3, and explain a procedure until it establishes layer 2 link using the sequence shown in drawing 3 . The synchronization of the layer 1 between a terminal 61 and the child office 3 shall be started by supplying electric power to a terminal 61 side, and shall be established by the function of layer 1 termination circuit 31 of the child office 3 according to layer 1 starting of a terminal 61. Moreover, the layer 1 synchronization between a base station 2 and the ISDN network 1 shall always be established by the function of layer 1 termination circuit 21.
[0015] By establishing layer 1 synchronization, transmission and reception of layer 2 message are attained between a terminal 61 and the child office 3 and between a base station 2 and the ISDN network 1, and establishment of layer 2 link is started from a terminal 61 side. ID request (UI frame) message for acquiring SAPI and TEI from a terminal 61 towards the child office 3 first is sent out. In the child office 3, ID request message from a terminal 61 is detected by layer 2 termination circuit 32, and ID acquisition demand is sent out to a base station 2 using Cch100. This is a message for acquiring SAPI and TEI from the ISDN network 1 via a base station to the terminal of a local station.
[0016] If ID acquisition demand from the child office 3 is received, SAPI and TEI to the terminal office 61 are acquired, and this information is sent out as ID quota information to the child office 3 in a base station 2 using Cch100 by sending out ID request (UI frame) message to the ISDN network 1, and receiving ID assignment (UI frame) from the ISDN network 1 from the circuit 51 which the layer 1 synchronization has already established.
[0017] If the child office 3 receives ID quota information from a base station 2, ID assignment (UI frame) message is sent out for this information from a circuit 54 to a terminal 61, when a terminal 61 receives ID assignment message, assignment of SAPI and TEI is completed, and a terminal 61 sends out the SABME message for next establishing layer 2 link. Layer 2 termination circuit 32 of the child office 3 returns UA by SABME message reception from a terminal 61, and layer 2 link between a terminal 61 and the child office 3 establishes it at this event.
[0018] Then, Cch100 notifies that layer 2 link between a terminal 61 and the child office 3 established the child office 3 to a base station 2 (layer 2 ready report), and a base station 2 transmits a SABME message to the ISDN network 1, and makes layer 2 link between a base station 2 and the ISDN network 1 as well as between a terminal 61 and the child office 3 establish by layer 2 ready report reception from the child office 3.
[0019] Each layer 2 link can be established by the above procedure between a terminal 61, between the child offices 3 and a base station 2, and the ISDN network 1, and a terminal 61 and the 1SDN network 1 can communicate now via the child office 3 and a base station 2 with it. SAPI and TEI which were explained even here, ID request, ID assignment, SABME, and UA are the vocabulary well-known in an ISDN communication mode, and a signal name, and all are contained in layer 2 condition.
(2) In the case of call origination, explain as an example the case where the terminal 61 held in the child office 3 carries out call origination, using the sequence shown in drawing 4 . By the procedure shown in (1), layer 2 link between a terminal 61 and the child office 3 and between a base station 2 and the ISDN network 1 shall already be set up. When call origination is carried out from a terminal 61, a SETUP (I frames) message is sent out towards the child office 3 from a terminal 61. This is layer 3 message which notifies call origination.
[0020] In the child office 3, by the layer 3 message monitoring facility, the SETUP message from a terminal 61 is detected and TS quota demand is sent out to a base station 2 using Cch100. This is a message for requiring the time-slot assignment for Bch of the terminal held in the local station, and the number of TS by which SAPl acquired at the time of ID of the child office 3 and layer 2 linkup and TEI are contained in this message and which requires the child office 3 using the information in a SETUP message further is investigated, and is added to said TS quota demand as information.
[0021] In a base station 2, if TS quota demand from the child office 3 is received, only the number demanded with reference to the TS managed table 23 will add TS number to assign to TS quota

response, and will be transmitted to the child office 3. That is, it transmits to the Cch frame including ID of the child office 3, SAPI, TEI, and TS number.
[0022] When the child office 3 receives TS quota message from a base station 2, Dch from the ISDN network 1 to a terminal 61 and TS for Bch are established. The child office 3 Although the SETUP message which had received from the terminal 61 is transmitted in TS for Dch which was able to be assigned FUROTOKORU which was being conventionally used even if not based on ISDN can be used for the protocol between a child office and a base station as it is. The message of Dch which the child office 3 received from the terminal 61 is changed into the message between a child office and a base station, and is transmitted to a base station 2 as a Dch information message.
[0023] A base station 2 reconverts the received Dch information in a SETUP message, and transmits it to the ISDN network 1. After this, a Frame Relay is carried out like [in TS for Dch] the case of a SETUP message by layer 3 message (CALL PROC, ALERT, CONNECT) which a base station 2 receives from the ISDN network 1, and call origination is materialized by being transmitted to a terminal 61.
(3) In the case of a call in, explain as an example the case where a call in is in the terminal 61 held in the child office 3. The line connection sequence at the time of a call in is shown in drawing 5 . When a call in occurs, a SETUP message is first sent out from the ISDN network 1 to the circuit 51 corresponding to the terminal 61 by the side of a base station 2. This is layer 3 message which shows the call in from the ISDN network 1 side.
[0024] A base station 2 changes into the message between a child office and a base station the SETUP message which received from the ISDN network 1, and transmits it to the child office 3 by Cch100 as a Dch information message. The child office 3 sends out TS quota demand to a base station 2, in order to require assignment of TS for Dch and Bch like call origination, if a SETUP message is detected in a Dch information message. The number of SAPI and TEI which were read from the SETUP message like the time of call origination, and TS to demand is contained in this message.
[0025] In a base station 2, if TS quota demand from the child office 3 is received, with reference to the TS managed table 23, TS number to assign will be added to TS quota response, and it will transmit to the child office 3. When the child office 3 receives TS quota response from a base station 2, TS from the ISDN network 1 to a terminal 61 is established. The child office 3 reconverts the received Dch information in a SETUP message, and transmits it to a terminal 61.
[0026] After this, the Frame Relay of the layer 3 message (CONN ACK) which layer 3 message (ALERT, CONNECT) and base station 2 which the child office 3 receives from a terminal 61 receive from the ISDN network 1 is carried out in assigned TS for Dch, it is transmitted to the ISDN network 1 and a terminal 61, respectively, and a call in is materialized.
(4) In the case of clear back, explain as an example the case where the terminal 61 held in the child office 3 which is in a condition during a call carries out clear back. Although a base station 2 and the child office 3 perform the Frame Relay of layer 3 message which should be transmitted and received between the ISDN network 1 and a terminal 61 when it is in a condition during a call To it and coincidence, the child office 3 is supervising the RELEASE message which is layer 3 message which means the clear back of an ISDN call. When a RELEASE message is detected in layer 3 message which received from the terminal 61, or the Dch information received from the base station 2, processing which releases TS between a base station 2 and the child office 3 is performed.
[0027] The line disconnection sequence at the time of carrying out clear back to drawing 6 from a terminal side is shown. When a terminal 61 carries out clear back during a call, a DISCONNECT message is transmitted to the ISDN network 1 via the child office 3 and a base station 2 from a terminal 61, and the ISDN network 1 which received the DISCONNECT message returns a RELEASE message. This RELEASE message is transmitted to the child office 3 as Dch information from a base station 2.
[0028] The child office 3 transmits TS release request by Cch100 to a base station 2 in order to release TS which was being used for Bch at the same time it transmits a RELEASE message to a terminal 61 if a RELEASE message is detected in the Dch information from a base station 2.
[0029] If TS release request is received, a base station 2 will rewrite TS condition in the TS managed

table 23 to idle status, and will transmit TS release response to the child office 3, and release of Dch and TS for Bch will complete it. Then, REL A COMP message is transmitted to the ISDN network 1 via a base station 2 by Cch100 from the child office 3 from a terminal 61 in the child office 3, and if the ISDN network 1 receives this, the clear back as an ISDN call will be completed.
[0030] Drawing 7 shows the line disconnection sequence at the time of carrying out clear back from an ISDN network side. When the call partner of a terminal 61 does clear back during a call, the terminal 61 with which it was transmitted to the terminal 61 via the base station 2 and the child office 3 from the ISDN network 1, and the DISCONNECT message received the DISCONNECT message returns a RELEASE message.
[0031] The child office 3 transmits TS release request in CchlOO to a base station 2 in order to release TS which was being used for Bch at the same time it will include a RELEASE message in Dch information and will transmit to a base station 2, if the RELEASE message from a terminal 61 is detected.
[0032] If a base station 2 transmits the RELEASE message within the received Dch information to the ISDN network 1 as it is and TS release request is received further, it will rewrite TS condition in the TS managed table 23 to idle status, and will transmit TS disconnection response to the child office 3, and release of Dch and TS for Bch will complete it.
[0033] Then, REL A COMP message is transmitted to a terminal 61 via a base station 2 and the child office 3 from the ISDN network 1, and if a terminal 61 receives this, the clear back as an ISDN call will be completed.
[0034] If the approach stated to (6) from (1) above is used, according to the call origination from each child office, and the call in to each child office, the communication line for Dch and Bch will be assigned, and it will become possible to release the communication line for Dch and Bch according to termination of a call. That is, two or more terminals can share limited TS, and improvement in large frequency utilization effectiveness is attained compared with the conventional ISDN service method. Moreover, it can respond easily also to the increment in a subscriber.
[0035] Next, the 2nd example of this invention is explained with reference to drawing 2 . In the configuration of drawing 2 , by a base station's 2 carrying out the direct monitor of the layer 3 message which receives from the ISDN network 1, and starting assignment/release processing of TS for Dch and Bch, the layer 3 from a terminal 61 can perform the load distribution of signal processing between a base station and a child office, when the child office 3 acts as a monitor like the 1st example. This method is an effective means to the high system of traffic.
[0036] A sequence when terminal 61 call in occurs from the ISDN network 1 in the 2nd example is explained as compared with drawing 5 which is the call-in sequence diagram of the 1st example. The call-in sequence diagram in the 2nd example is shown in drawing 8 . When a base station 2 receives a SETUP message from the ISDN network 1, it sets to drawing 5 . Transmit a base station 2 to the child office 3 by making a SETUP message into Dch information, and it sets to drawing 8 to the child office 3 analyzing the SETUP message. Since TS which a base station 2 analyzes a direct SETUP message, and assigns is determined, it is effective in processing speed increasing in connection with the effectiveness and it which make processing of the child office 3 mitigate.
[0037]
[Effect of the Invention] As explained above, since it has realized assignment of the communication line between a base station and a child office by demand assignment, this invention can use effectively the communication line between a base station and a child office, thereby, can improve a circuit utilization ratio and has the effectiveness that the number of hold subscribers can be substantially increased now.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the ISDN service approach which the base station which has a layer 2 termination function especially, and a child office apply to the demand assignment mold cross connection method which offers the communication line of an ISDN Basic Rate Interface (2B+D) using the transmission channel assigned for every subscriber according to generating/termination of a call about the ISDN service approach in the multi-direction multiplex communication system.

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PRIOR ART

[Description of the Prior Art] The conventional multi-direction multiplex communication system is explained using drawing 9 . Drawing 9 shows the multi-direction multiplex communication structure of a system which offers the conventional ISDN Basic Rate Interface. In drawing 9 , the communication line between the child offices 3, 4, and 5 and a base station 2 is the so-called Puri Asa Inn mold cross connection method always assigned irrespective of communicative existence. An ISDN Basic Rate Interface has two Bch(es) (64kbps) and one Dch (16kpbs) on one a user and a network interface, and is an interface usable in common in various services of a telephone / not telephoning. Therefore, in the conventional example, as shown in drawing 9 , only the number of the ISDN Basic Rate Interfaces held (N individual) is required for the communication line between a base station and a child office.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, since it has realized assignment of the communication line between a base station and a child office by demand assignment, this invention can use effectively the communication line between a base station and a child office, thereby, can improve a circuit utilization ratio and has the effectiveness that the number of hold subscribers can be substantially increased now.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In the Prior art, only the number of ISDN interfaces held is required for the communication line between a base station and a child office, and also when not communicating, the communication line is always assigned. Moreover, although the user is available in the terminal of a telephone, FAX, a data terminal, etc., such traffic density is considered to be few compared with the case where the dedicated line is used. Therefore, irrespective of communicative existence, by the conventional method which always assigns the communication line, the subscriber held is restricted and there is a problem that the prompt action to the increment in a subscriber is difficult, and the utilization effectiveness of a communication line falls dramatically.
[0004] By making it the demand assignment method assigned according to generating of a call instead of the Puri Asa Inn method which always assigns the communication line, the object of this invention aims at a deployment of a communication line, and is to offer the ISDN service approach which raises transmission efficiency.

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MEANS

[Means for Solving the Problem] In the multi-direction multiplex communication system which this invention is constituted by a base station and two or more child offices, performs assignment/release of the channel for transmission between a base station and the terminal office according to generating/termination of a call, and holds an ISDN Basic Rate Interface By, as for a base station, a child office's carrying out termination even of the layer 2 to an ISDN terminal, respectively, and supervising layer 3 message to an ISDN network, generating/termination of a call are recognized and it is characterized by performing assignment/release of the channel for transmission between a base station and the terminal office.
[0006] By responding to generating/termination of a call, and assigning / releasing a communication line, this invention is an ISDN service method which offers the communication line of an ISDN Basic Rate Interface, acts even a layer 2 as the monitor of termination and the layer 3 message in a base station and a child office, respectively, and has the means which assigns the communication line between a base station and a child office by detection of the start up message of a call out of said signal, and a means to release said communication line by detection of the end message of a call.
[0007] Generating/termination of an ISDN subscriber's call are detected by carrying out the monitor of the layer 3 message in a base station or a child office, and assignment/release of the communication line between a base station and a child office are performed. It becomes unnecessary for this reason, to always assign a communication line.
[0008]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
[0009] Drawing 1 is system configuration drawing of the multi-direction multiplex communication system of the demand assignment mold which applies this invention. The circuits 51, 52, and 53 of the ISDN network 1 are connected to a base station 2, and the circuits 54, 55, and 56 which have held the child offices 3 and 4 support circuits 51, 52, and 53, and set up the communication line between the child offices 3 and 4 and a base station 2 by assignment / demand assignment line control to release according to generating/termination of a call. Therefore, there may be few communication lines between a base station and a child office than the number of subscribers which this system has held. The child offices 3 and 4 offer U points of an ISDN Basic Rate Interface to the network termination 171, 72, and NT 73 which has held terminals 61, 62, and 63.
[0010] The system configuration of the 1st example of this invention is shown in drawing 2 . In drawing 2 , the Basic Rate Interface circuits 51, 52, and 53 from the ISDN network 1 are held in the base station 2. A base station 2 and the child offices 3 and 4 are performing the Time-Division-Multiplexing (TDMA) communication link. In drawing 2 , between a base station 2 and the child offices 3 and 4, it responds to generating/termination of a call, and provides by the demand assignment line control which assigns / releases a TDMA time slot (TS) as a communication line to Dch and Bch. The frame structure of the signal transmitted and received between a base station 2, the child office 3, and 4 all over drawing is shown. Cch100 is a common control channel and is used for transfer of the control information of TS

assignment between a base station 2, the child office 3, and 4, and the Dch information on a Basic Rate Interface.

[0011] While a base station 2 and the child offices 3 and 4 have layer 1 termination circuits 21, 31, and 41 and layer 2 termination circuits 22, 32, and 42 which carry out termination of its layer 1 of its and the layer 2 and can perform establishment synchronous [between a base station and an ISDN network and between a child office and an ISDN terminal / layer 1], and establishment of layer 2 link according to its individual of its, they can carry out the monitor of the two or more-layer message.

[0012] Layer 1 and layer 2 termination circuit is the same as that of a well-known thing at an ISDN communication mode, and these are easily realizable if LSI based on a CCITT criterion is used. Moreover, each child office can transmit and receive voice and data in TS specified from the transceiver function and base station of Cch. The interface between a child office and a terminal and between a base station and an ISDN network is U points of an ISDN Basic Rate Interface.

[0013] In the base station 2, it has the function to manage TS other than the transceiver function of Cch, and required TS is assigned with reference to the TS managed table 23 to Dch and Bch according to generating of a call. The circuits 51, 52, and 53 corresponding to the ISDN terminals 61, 62, and 63 are held in the base station.

[0014] Next, actuation of this example is explained to a detail with reference to the sequence diagram of drawing 7 from drawing 3 . When a call in occurs to the terminal held in the child office when call origination occurs from the terminal held in the child office, the layer 2 linkup procedure between the ISDN networks which have held the base station, and the terminal held in the child office after the layer 2 linkup, and it is clear back, sequence actuation of an about is explained.

(1) As an example of a layer 2 linkup procedure, electric power is supplied to the terminal 61 held in the child office 3, and explain a procedure until it establishes layer 2 link using the sequence shown in drawing 3 . The synchronization of the layer 1 between a terminal 61 and the child office 3 shall be started by supplying electric power to a terminal 61 side, and shall be established by the function of layer 1 termination circuit 31 of the child office 3 according to layer 1 starting of a terminal 61. Moreover, the layer 1 synchronization between a base station 2 and the ISDN network 1 shall always be established by the function of layer 1 termination circuit 21.

[0015] By establishing layer 1 synchronization, transmission and reception of layer 2 message are attained between a terminal 61 and the child office 3 and between a base station 2 and the ISDN network 1, and establishment of layer 2 link is started from a terminal 61 side. ID request (UI frame) message for acquiring SAPI and TEI from a terminal 61 towards the child office 3 first is sent out. In the child office 3, ID request message from a terminal 61 is detected by layer 2 termination circuit 32, and ID acquisition demand is sent out to a base station 2 using Cch100. This is a message for acquiring SAPI and TEI from the ISDN network 1 via a base station to the terminal of a local station.

[0016] If ID acquisition demand from the child office 3 is received, SAPI and TEI to the terminal office 61 are acquired, and this information is sent out as ID quota information to the child office 3 in a base station 2 using Cch100 by sending out ID request (UI frame) message to the ISDN network 1, and receiving ID assignment (UI frame) from the ISDN network 1 from the circuit 51 which the layer 1 synchronization has already established.

[0017] If the child office 3 receives ID quota information from a base station 2, ID assignment (UI frame) message is sent out for this information from a circuit 54 to a terminal 61, when a terminal 61 receives ID assignment message, assignment of SAPI and TEI is completed, and a terminal 61 sends out the SABME message for next establishing layer 2 link. Layer 2 termination circuit 32 of the child office 3 returns UA by SABME message reception from a terminal 61, and layer 2 link between a terminal 61 and the child office 3 establishes it at this event.

[0018] Then, Cch100 notifies that layer 2 link between a terminal 61 and the child office 3 established the child office 3 to a base station 2 (layer 2 ready report), and a base station 2 transmits a SABME message to the ISDN network 1, and makes layer 2 link between a base station 2 and the ISDN network 1 as well as between a terminal 61 and the child office 3 establish by layer 2 ready report reception from the child office 3.

[0019] Each layer 2 link can be established by the above procedure between a terminal 61, between the child offices 3 and a base station 2, and the ISDN network 1, and a terminal 61 and the 1SDN network 1 can communicate now via the child office 3 and a base station 2 with it. SAPI and TEI which were explained even here, ID request, ID assignment, SABME, and UA are the vocabulary well-known in an ISDN communication mode, and a signal name, and all are contained in layer 2 condition.
(2) In the case of call origination, explain as an example the case where the terminal 61 held in the child office 3 carries out call origination, using the sequence shown in drawing 4 . By the procedure shown in (1), layer 2 link between a terminal 61 and the child office 3 and between a base station 2 and the ISDN network 1 shall already be set up. When call origination is carried out from a terminal 61, a SETUP (I frames) message is sent out towards the child office 3 from a terminal 61. This is layer 3 message which notifies call origination.
[0020] In the child office 3, by the layer 3 message monitoring facility, the SETUP message from a terminal 61 is detected and TS quota demand is sent out to a base station 2 using Cch100. This is a message for requiring the time-slot assignment for Bch of the terminal held in the local station, and the number of TS by which SAPl acquired at the time of ID of the child office 3 and layer 2 linkup and TEI are contained in this message and which requires the child office 3 using the information in a SETUP message further is investigated, and is added to said TS quota demand as information.
[0021] In a base station 2, if TS quota demand from the child office 3 is received, only the number demanded with reference to the TS managed table 23 will add TS number to assign to TS quota response, and will be transmitted to the child office 3. That is, it transmits to the Cch frame including ID of the child office 3, SAPI, TEI, and TS number.
[0022] When the child office 3 receives TS quota message from a base station 2, Dch from the ISDN network 1 to a terminal 61 and TS for Bch are established. The child office 3 Although the SETUP message which had received from the terminal 61 is transmitted in TS for Dch which was able to be assigned FUROTOKORU which was being conventionally used even if not based on ISDN can be used for the protocol between a child office and a base station as it is. The message of Dch which the child office 3 received from the terminal 61 is changed into the message between a child office and a base station, and is transmitted to a base station 2 as a Dch information message.
[0023] A base station 2 reconverts the received Dch information in a SETUP message, and transmits it to the ISDN network 1. After this, a Frame Relay is carried out like [in TS for Dch] the case of a SETUP message by layer 3 message (CALL PROC, ALERT, CONNECT) which a base station 2 receives from the ISDN network 1, and call origination is materialized by being transmitted to a terminal 61.
(3) In the case of a call in, explain as an example the case where a call in is in the terminal 61 held in the child office 3. The line connection sequence at the time of a call in is shown in drawing 5 . When a call in occurs, a SETUP message is first sent out from the ISDN network 1 to the circuit 51 corresponding to the terminal 61 by the side of a base station 2. This is layer 3 message which shows the call in from the ISDN network 1 side.
[0024] A base station 2 changes into the message between a child office and a base station the SETUP message which received from the ISDN network 1, and transmits it to the child office 3 by Cch100 as a Dch information message. The child office 3 sends out TS quota demand to a base station 2, in order to require assignment of TS for Dch and Bch like call origination, if a SETUP message is detected in a Dch information message. The number of SAPI and TEI which were read from the SETUP message like the time of call origination, and TS to demand is contained in this message.
[0025] In a base station 2, if TS quota demand from the child office 3 is received, with reference to the TS managed table 23, TS number to assign will be added to TS quota response, and it will transmit to the child office 3. When the child office 3 receives TS quota response from a base station 2, TS from the ISDN network 1 to a terminal 61 is established. The child office 3 reconverts the received Dch information in a SETUP message, and transmits it to a terminal 61.
[0026] After this, the Frame Relay of the layer 3 message (CONN ACK) which layer 3 message (ALERT, CONNECT) and base station 2 which the child office 3 receives from a terminal 61 receive

from the ISDN network 1 is carried out in assigned TS for Dch, it is transmitted to the ISDN network 1 and a terminal 61, respectively, and a call in is materialized.
(4) In the case of clear back, explain as an example the case where the terminal 61 held in the child office 3 which is in a condition during a call carries out clear back. Although a base station 2 and the child office 3 perform the Frame Relay of layer 3 message which should be transmitted and received between the ISDN network 1 and a terminal 61 when it is in a condition during a call To it and coincidence, the child office 3 is supervising the RELEASE message which is layer 3 message which means the clear back of an ISDN call. When a RELEASE message is detected in layer 3 message which received from the terminal 61, or the Dch information received from the base station 2, processing which releases TS between a base station 2 and the child office 3 is performed.
[0027] The line disconnection sequence at the time of carrying out clear back to drawing 6 from a terminal side is shown. When a terminal 61 carries out clear back during a call, a DISCONNECT message is transmitted to the ISDN network 1 via the child office 3 and a base station 2 from a terminal 61, and the ISDN network 1 which received the DISCONNECT message returns a RELEASE message. This RELEASE message is transmitted to the child office 3 as Dch information from a base station 2.
[0028] The child office 3 transmits TS release request by Cch100 to a base station 2 in order to release TS which was being used for Bch at the same time it transmits a RELEASE message to a terminal 61 if a RELEASE message is detected in the Dch information from a base station 2.
[0029] If TS release request is received, a base station 2 will rewrite TS condition in the TS managed table 23 to idle status, and will transmit TS release response to the child office 3, and release of Dch and TS for Bch will complete it. Then, REL A COMP message is transmitted to the ISDN network 1 via a base station 2 by Cch100 from the child office 3 from a terminal 61 in the child office 3, and if the ISDN network 1 receives this, the clear back as an ISDN call will be completed.
[0030] Drawing 7 shows the line disconnection sequence at the time of carrying out clear back from an ISDN network side. When the call partner of a terminal 61 does clear back during a call, the terminal 61 with which it was transmitted to the terminal 61 via the base station 2 and the child office 3 from the ISDN network 1, and the DISCONNECT message received the DISCONNECT message returns a RELEASE message.
[0031] The child office 3 transmits TS release request in CchlOO to a base station 2 in order to release TS which was being used for Bch at the same time it will include a RELEASE message in Dch information and will transmit to a base station 2, if the RELEASE message from a terminal 61 is detected.
[0032] If a base station 2 transmits the RELEASE message within the received Dch information to the ISDN network 1 as it is and TS release request is received further, it will rewrite TS condition in the TS managed table 23 to idle status, and will transmit TS disconnection response to the child office 3, and release of Dch and TS for Bch will complete it.
[0033] Then, REL A COMP message is transmitted to a terminal 61 via a base station 2 and the child office 3 from the ISDN network 1, and if a terminal 61 receives this, the clear back as an ISDN call will be completed.
[0034] If the approach stated to (6) from (1) above is used, according to the call origination from each child office, and the call in to each child office, the communication line for Dch and Bch will be assigned, and it will become possible to release the communication line for Dch and Bch according to termination of a call. That is, two or more terminals can share limited TS, and improvement in large frequency utilization effectiveness is attained compared with the conventional ISDN service method. Moreover, it can respond easily also to the increment in a subscriber.
[0035] Next, the 2nd example of this invention is explained with reference to drawing 2 . In the configuration of drawing 2 , by a base station's 2 carrying out the direct monitor of the layer 3 message which receives from the ISDN network 1, and starting assignment/release processing of TS for Dch and Bch, the layer 3 from a terminal 61 can perform the load distribution of signal processing between a base station and a child office, when the child office 3 acts as a monitor like the 1st example. This method is an effective means to the high system of traffic.

[0036] A sequence when terminal 61 call in occurs from the ISDN network 1 in the 2nd example is explained as compared with drawing 5 which is the call-in sequence diagram of the 1st example. The call-in sequence diagram in the 2nd example is shown in drawing 8 . When a base station 2 receives a SETUP message from the ISDN network 1, it sets to drawing 5 . Transmit a base station 2 to the child office 3 by making a SETUP message into Dch information, and it sets to drawing 8 to the child office 3 analyzing the SETUP message. Since TS which a base station 2 analyzes a direct SETUP message, and assigns is determined, it is effective in processing speed increasing in connection with the effectiveness and it which make processing of the child office 3 mitigate.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is system configuration drawing of the multi-direction multiplex communication system of the demand assignment mold which applies this invention.
[Drawing 2] It is system configuration drawing showing the 1st example of this invention.
[Drawing 3] It is the sequence diagram showing a layer 2 link probability procedure.
[Drawing 4] It is the sequence diagram showing the line connection at the time of the call origination from a terminal side.
[Drawing 5] It is the sequence diagram showing the line connection at the time of the call in from an ISDN network side.
[Drawing 6] It is the sequence diagram showing the line disconnection at the time of the clear back from a terminal side.
[Drawing 7] It is the sequence diagram showing the line disconnection at the time of the clear back from an ISDN network side.
[Drawing 8] It is the sequence diagram showing the line connection at the time of the call in from the ISDN network side in the 2nd example.
[Drawing 9] It is drawing showing the ISDN service approach in the conventional multi-direction multisystem.
[Description of Notations]
1 ISDN Network
2 Base Station
3, 4, 5 Child office
21, 31, 41 Layer 1 termination circuit
22, 32, 42 Layer 2 termination circuit
23 TS Managed Table
51, 52, 53, 54, 55, 56, 57 ISDN Basic Rate Interface circuit
61, 62, 63 ISDN terminal
71, 72, 73 Network termination 1 (NT1)
100 Control Channel (Cch)

[Translation done.]

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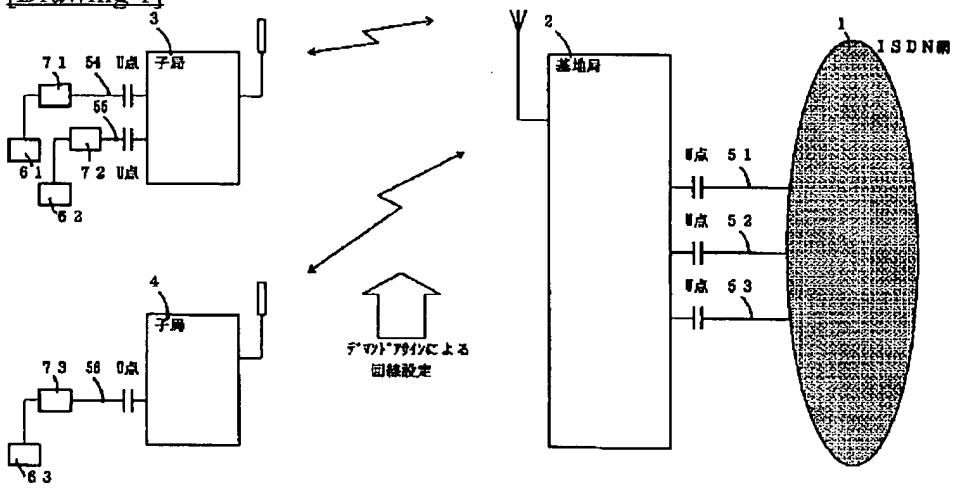
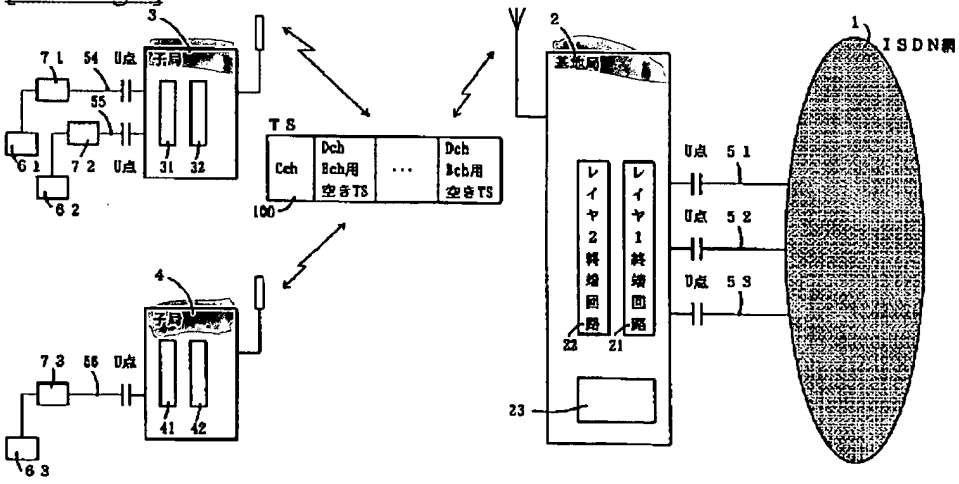
DRAWINGS

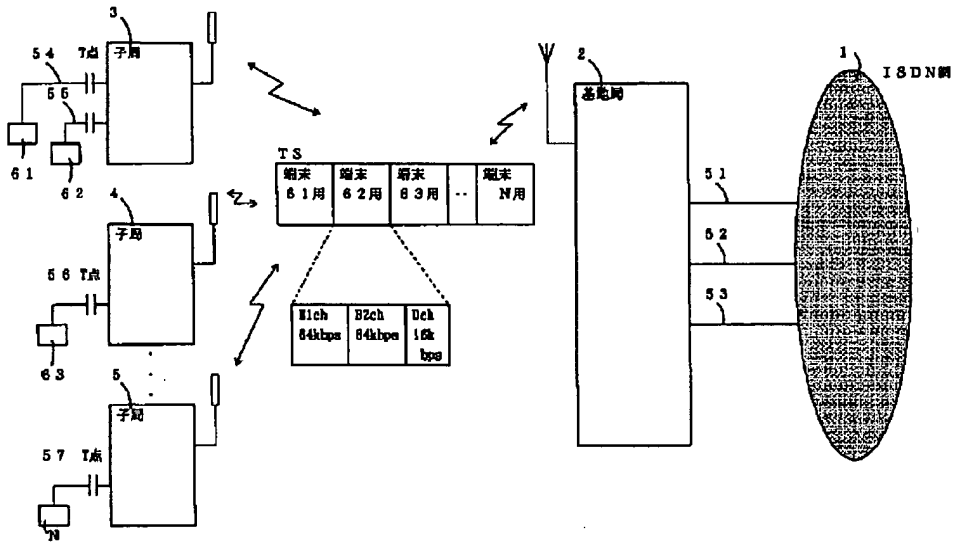
[Drawing 1]



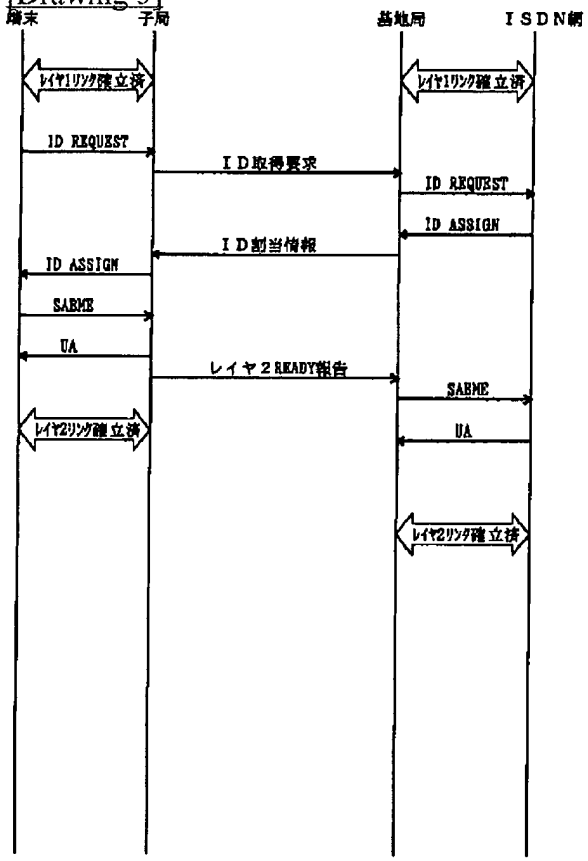
[Drawing 2]



[Drawing 9]

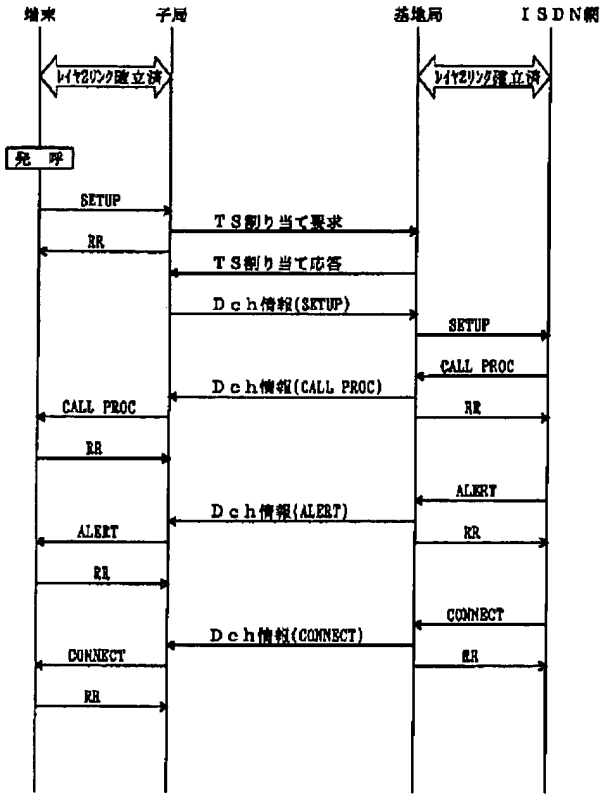


[Drawing 3]



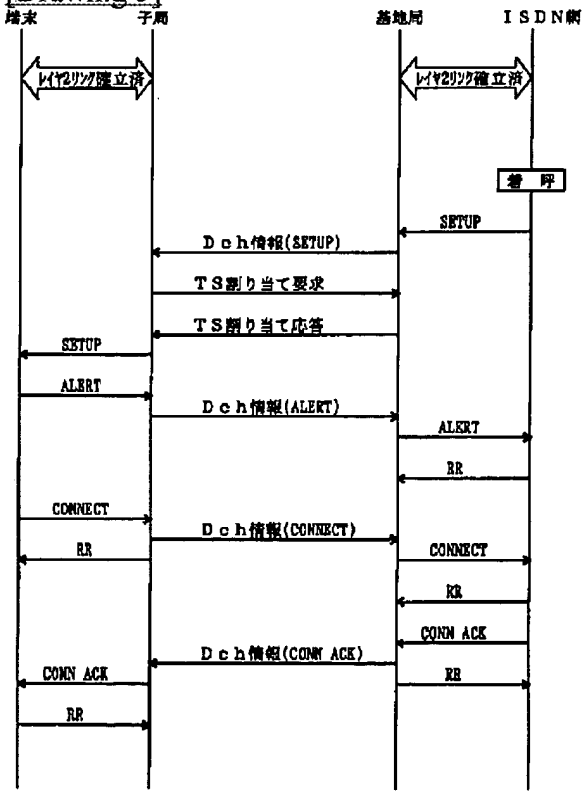
レイヤ2リンク確立シーケンス

[Drawing 4]



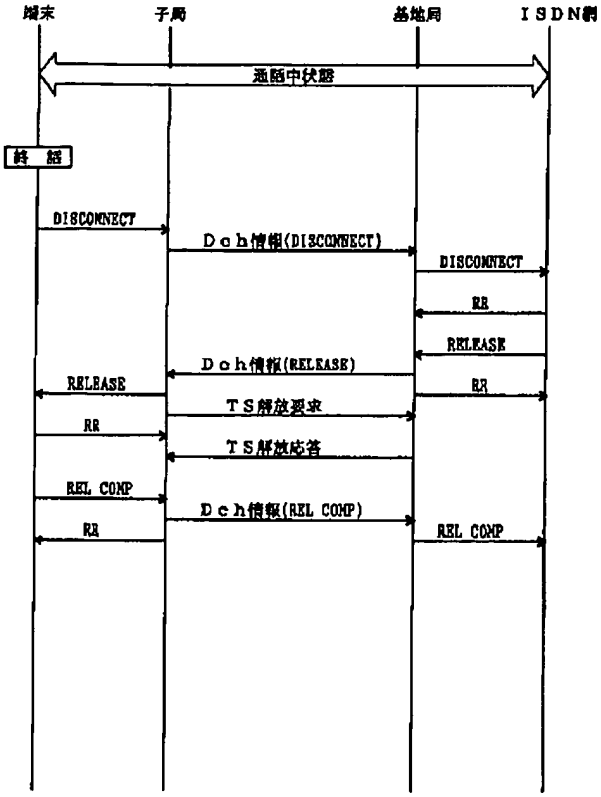
発呼シーケンス

[Drawing 5]



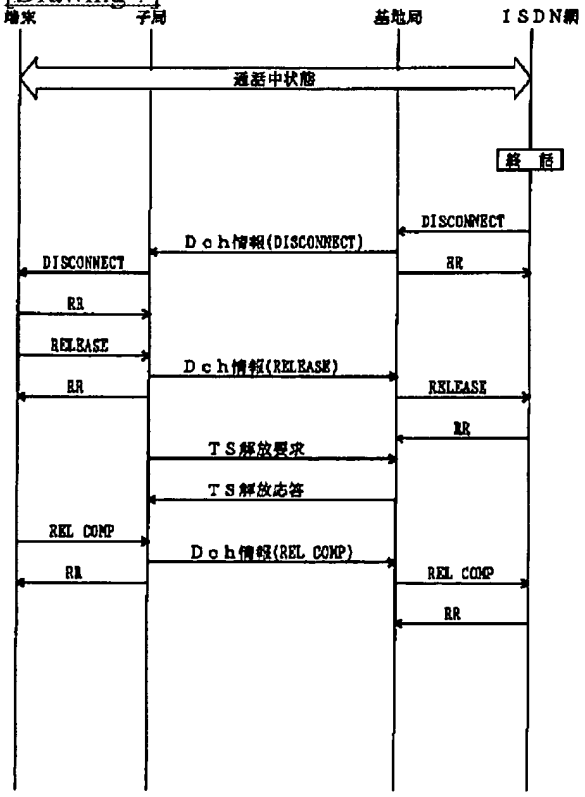
着呼シーケンス

[Drawing 6]



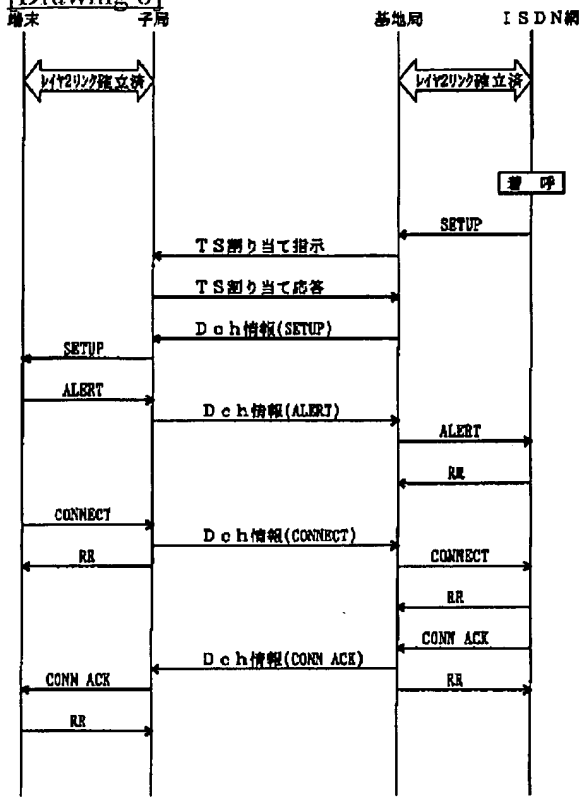
端末からの終話シーケンス

[Drawing 7]



ＩＳＤＮ網側からの終話シーケンス

[Drawing 8]



第２の実施例における着呼シーケンス

[Translation done.]